

MEMORANDUM

DATE: July 1, 2019

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SUBJECT: **Incomplete and Inadequate Evaluation of Watershed Health and Function and Aquatic and Terrestrial Resources**

Introduction

This memorandum provides comments on the Draft Environmental Impact Statement (DEIS) dated February 22, 2019 for the Proposed Pebble Project. The Proposed Pebble Project is large in scope, with potential impacts that would be extraordinarily adverse. The DEIS is neither sufficiently complete to enable a sound permit decision nor sufficiently clear for reviewers to fully understand the proposed project and make informed comments and recommendations. The health and function of a watershed not only affects aquatic and terrestrial resources, it also affects the health of Alaska Native communities and the function of Alaska Native culture. As written, the DEIS parses out the ecological issues and does not recognize that ecological health and function are directly related to the survival of Native people, sovereign governments, and communities.

The DEIS fails to provide the following, as required by the Council on Environmental Quality (CEQ) regulations:

NEPA procedures must insure that environmental information is available to public officials and citizens before decisions are made and before actions are taken. The information must be of high quality. Accurate scientific analysis, expert agency comments, and public scrutiny are essential to implementing NEPA. Most important, NEPA documents must concentrate on the issues that are truly significant to the action in question, rather than amassing needless detail.

40 C.F.R. § 1500.1(b).

To summarize the areas in which the DEIS falls short of CEQ regulations, three Key Issues have been identified for Section 3 Affected Environment and Section 4 Environmental Consequences of the DEIS and are further explained in later sections of this memorandum:

- Key Issue 1: The evaluation of potential impacts to watershed ecosystems, aquatic resources, and wildlife is inadequate.
- Key Issue 2: The evaluation of potential impacts to water, fish, and aquatic resources, especially salmon, is inadequate.
- Key Issue 3: The evaluation of potential impacts to wildlife, migratory routes, and threatened and endangered species is inadequate.

Comments submitted to the U.S. Army Corps of Engineers (USACE) for the Preliminary DEIS (PDEIS) are the basis for identifying these three key issues and addressing each in this memorandum. The USACE did not address or adequately respond to the previous PDEIS comments; therefore, these PDEIS comments remain applicable to the DEIS. The previously submitted PDEIS comments are included with this memorandum by reference. These PDEIS comments are also summarized and referenced throughout this memorandum.

Given the significance of this fatally flawed and misleading DEIS document, the DEIS should be completely revised after public comments are received and adequate baseline studies are completed to facilitate appropriate evaluation of short-term and long-term direct, indirect and cumulative impacts that will result in irreversible damage and irretrievable commitments of aquatic and terrestrial resources in Bristol Bay and Cook Inlet watersheds. Once redrafted, the DEIS should be reissued with a new public comment period with an appropriate amount of time for the public to review and comment on a project of this magnitude.

Methods

The uniqueness of the Bristol Bay and Cook Inlet watersheds and their ecological, spiritual, cultural, and economic importance to the world are described at length in countless documents. Because the DEIS is so deficient, several other commonly recognized, authoritative resources were referenced to facilitate review of the DEIS and to develop this memorandum. The following list of resources was used to better understand the ecological baseline conditions of the watersheds and communities inhabiting these watersheds—information which could NOT be found in the DEIS. These scientific publications also provide thorough assessments of expected

short- and long-term, cumulative and irreversible impacts to the Bristol Bay and Cook Inlet watersheds that will occur if the Proposed Pebble Project is permitted, constructed, and operated:

- USEPA (U.S. Environmental Protection Agency). 2014a. An Assessment of Potential Mining Impacts on Salmon Ecosystems of Bristol Bay, Alaska including Appendices A - J. Region 10, Seattle, WA. EPA 910-R-14-001.
- USEPA (U.S. Environmental Protection Agency). 2014b. Proposed Determination of the U.S. Environmental Protection Agency Region 10 Pursuant to Section 404(c) of the Clean Water Act, Pebble Deposit Area, Southwest Alaska. Region 10, Seattle, WA.
- Woody, C.A (Editor). 2018. Bristol Bay Alaska. Natural Resources of the Aquatic and Terrestrial Ecosystems. J. Ross Publishing.
- Albert, D. 2011. A Preliminary Framework for Assessment of Ecological Risk to Wild Salmon from Large-scale Mining in Bristol Bay, Alaska. The Nature Conservancy.
- Albert, D. 2018. A Preliminary Assessment of Direct Effects of the Pebble Limited Partnership 2017 proposal for Pebble Mine on Wetlands and Salmon Streams in headwaters of Bristol Bay, Alaska. The Nature Conservancy.
- Chambers, D. et. al. 2012. Bristol Bay's Wild Salmon Ecosystems and the Pebble Mine: Key Considerations for a Large-Scale Mine Proposal: produced in partnership with the Wild Salmon Center and Trout Unlimited.
- Frissell, C. 2013. Foreseeable Environmental Impact of Potential Road and Pipeline Development on Water Quality and Freshwater Fishery Resources of Bristol Bay, Alaska.
- Suring, L.H. et. al. 2017. Incorporating habitat use and movement patterns of focal species into wildlife mitigation strategies for highways on the Kenai Peninsula, Alaska, USA.
- Suring, L.H. 2019. The Pebble Project and McNeil River Brown Bears.
- Wink, A. 2018. Economic Benefits of the Bristol Bay Salmon Industry.
- Wobus, C. et. al. 2018. Modeling the Impacts of a Tailings Dam Failure at the Pebble Mine.

- State and Federal Aquatic and Terrestrial Natural Resource Agency websites and data.
- Traditional Ecological Knowledge and Wisdom.

The scientific sources listed above, and other readily available scientific literature (ignored by PLP and the Corps) provide an immense amount of relatively current and very relevant information about the Bristol Bay and Cook Inlet watersheds. Since various Federal laws and regulations require the DEIS provide a thorough and comprehensive description of existing environmental conditions and evaluate short-term and long-term direct, indirect, and cumulative impacts to the environment, including aquatic and terrestrial species and resources in the Bristol Bay and Cook Inlet watersheds, this memorandum does not include a full and specific description or evaluation of the environmental setting of the Proposed Pebble Project and its potential impacts. But it does provide a summary of this important ecosystem and the most significant inadequacies and deficiencies of the DEIS in identifying, describing, and evaluating the potential impacts of the proposed project on this fully functioning natural ecosystem.

Bristol Bay and Cook Inlet

Bristol Bay and its six major river basins, which cover approximately 44,000 square miles, are one of the most unique, wild, and pristine areas in the **world** supporting numerous species of fish, wildlife, and plants some of which are unique to this area. Little development is found in these watersheds, and the area is mostly uninhabited and roadless with virtually no air, noise, or light pollution. Bristol Bay and its intricate web of rivers, lakes, streams and wetlands provides extensive intact habitat to the largest relatively pristine sockeye salmon runs in the world. Bristol Bay supports hundreds of genetically distinct stocks of sockeye, each adapted to specific, localized environmental conditions found throughout the system. Close to half of the world's sockeye salmon are produced in the Bristol Bay region. Bristol Bay supports one of the largest Chinook salmon runs in the world. Sockeye salmon is the keystone species knitting the ecosystems in the watersheds and the Bristol Bay region together. The sockeye and other salmon in the region produce some of the most nutrient rich waters and productive freshwater habitat in the world. Marine derived nutrients from salmon support diverse and productive populations of resident fish, migratory birds, large and small terrestrial mammals, and insects. All of these resources in turn support Alaska Natives and their "salmon culture" as well as significant recreational and commercial fishing, wildlife viewing, and wilderness-oriented experiences.

The Bristol Bay watersheds include Iliamna Lake, the largest lake in Alaska and one of the world's largest sockeye salmon rearing areas. Chinook, coho, chum, and pink salmon are other significant salmon runs that thrive in the watersheds. Bristol Bay fisheries are an economic engine that support businesses and livelihoods in Alaska, the lower 48 states, and throughout the world. Bristol Bay fisheries provide jobs for close to 15,000 people and generate approximately \$1.2 billion in economic output and \$658 million in labor income each year (Wink, A. 2018). Bristol Bay watersheds not only support the world's largest sustainable and renewable commercial fishery, these watersheds also support subsistence and sport fisheries including a thriving ecotourism industry. Bristol Bay watersheds provide Alaskan communities with a plethora of wildlife and plant species on which they rely on a day-to-day basis.

In addition to economic benefits, many communities in the watersheds, Native and non-Native alike, interact with salmon as key parts of their subsistence way of life and economies. For Alaska Native communities, salmon have deep cultural and spiritual significance, and along with salmon, the region provides a sense of place and identity that is unique as it supports one of the last intact salmon-based cultures in the world. Bristol Bay provides a sustainable, healthy food source that greatly contributes to the health and well-being of generations of Alaska Native people and communities in the area. These people and communities are socially and culturally dependent on salmon and other natural and cultural resources provided by the watersheds. Beyond the Bristol Bay region, Bristol Bay fisheries also provide a wild, healthy protein source to people throughout the world.

Bristol Bay and its watersheds are also home to large populations of wildlife and birds including bear, wolf, moose, caribou, beaver, wolverine and otter. Iliamna Lake is home to a population of freshwater harbor seal that has recently been identified as genetically distinct from ocean-dwelling harbor seal. The Iliamna harbor seals live in and rely solely on the waters of Iliamna Lake for their entire lives. Millions of shorebirds, land birds, seabirds, and waterfowl migrate and reside in the area as do raptors and eagles. Over 100 bird species from around the world rely on the waters of the Bristol Bay watersheds to forage, breed, and rest. Ten percent of the western breeding population of trumpeter swan breed in the Bristol Bay Lowlands. Both Nushagak Bay and Kvichak Bay are recognized by the Audubon Society as areas of global importance. Marine mammals including sea lions, seals, porpoise, dolphins and whales are supported by Bristol Bay habitat and prey resources.

Along with the Bristol Bay watershed, portions of Cook Inlet watershed are included in the Proposed Pebble Project. Cook Inlet supports some of the largest salmon populations in the

world. These salmon populations support large commercial, subsistence, personal use, and sport fisheries, as well as ecotourism, in the area and beyond. The western shores of Cook Inlet are occupied by important conservation areas including national parks, national wildlife refuges, and State wildlife refuges and critical habitat areas, that provide habitat for aquatic and terrestrial species including the famous McNeil River and Katmai brown bear populations. Cook Inlet also provides a plethora of wildlife and plant species that support subsistence communities.

Cook Inlet supports a variety of federally-listed threatened and endangered species including Beluga whale, blue whale, bowhead whale, the sperm whale, humpback whale, fin whale North Pacific right Whale, Steller's sea lion, Northern sea otter, and Steller's eider (NOAA Fisheries, 2018b; USFWS, 2015; Woody, 2018). Cook Inlet marine waters and shorelines support crabs, butter clams, little neck clams, scallops, shrimp, groundfish including halibut, forage fish such as herring and smelt, and other resident and migratory fish and shellfish that provide important prey resources to fish and wildlife. These fish and shellfish also provide valuable commercial, sport, and subsistence resources to the region and beyond.

Critical habitat for the federally-threatened Beluga whale and threatened Northern sea otter is located in portions of the Cook Inlet that are within the project area (NOAA Fisheries, 2018b; USFWS, 2005). Critical habitat for the federally endangered Western Distinct Population Segment (DPS) of the Steller's sea lion is located in portions of Bristol Bay and the Gulf of Alaska, that could potentially be impacted by the proposed project (USFWS, 1990). State of Alaska Special Status Species in Bristol Bay and Cook Inlet include the following species listed as endangered by Alaska Department of Fish and Game (ADF&G): blue whale, humpback whale, and right whale (ADF&G, 2018). The Alaska Special Status Species also includes Fish Stocks of Concern. According to ADF&G, one of the stocks of Concern in Cook Inlet is McNeil River chum (ADF&G, 2018).

As stated in Appendix M of the DEIS, "[t]he State of Alaska closed many streams to mineral exploration in the Nushagak-Mulchatna River drainage as well as streams around Iliamna Lake (Mineral Closing Order 393). This closure is aimed at protecting Pacific salmon streams, including the North Fork Koktuli River, South Fork Koktuli River, and Upper Talarik Creek." (DEIS, Draft Conceptual Compensatory Mitigation Plan at 17). ADF&G holds certificates for reservations of water on the Lower Talarik, Newhalen River, Kvichak River, and Iliamna River. These reservations are intended to ensure that these waterbodies have adequate seasonal instream flows for salmonids to complete their life cycle.

Both Bristol Bay and Cook Inlet watersheds contain Essential Fish Habitat (EFH) for federally managed species. The Magnuson-Stevens Fishery Conservation and Management Act of 1996, as amended in 2007, mandates the identification of EFH for federally managed species and the consideration of recommendations to conserve and enhance the habitat necessary for these freshwater, estuarine, and marine species to carry out their life cycles. See 16 U.S.C. §§ 1801 & 1855. Essential Fish Habitat includes “those waters and substrate necessary to fish for spawning, breeding, feeding or growing to maturity.” 16 U.S.C. § 1802(10). “Waters” include “aquatic areas and their associated physical, chemical, and biological properties.” 50 C.F.R. § 600.10. “Substrate” includes sediment underlying the waters. 50 C.F.R. § 600.10. “Necessary” means “the habitat required to support a sustainable fishery and the managed species’ contribution to a healthy ecosystem.” 50 C.F.R. § 600.10. “Spawning, breeding, feeding, or growing to maturity” includes all habitat types used by a species throughout its lifecycle. The EFH also provides habitat for prey resources required by aquatic and terrestrial species in the freshwater, estuarine, and marine areas of Bristol Bay and Cook Inlet.

Bristol Bay and Cook Inlet watersheds include several regionally and globally important conservation areas for fish, birds, and wildlife. These areas are recognized and protected by state, federal, and international law and include national parks, wildlife refuges, a national monument, national wild and scenic rivers, a state park and other state protected areas, an international wetland of importance, and identified globally important bird areas including western hemispheric shorebird reserve networks.

Bristol Bay watersheds and Cook Inlet are pristine and wild ecosystems that must be protected.

Comments to DEIS Section 3 Affected Environment and Section 4 Environmental Consequences

Bristol Bay and Cook Inlet watersheds combine to create an interconnected and highly complex ecosystem that supports aquatic and terrestrial resources from the headwaters of upper tributaries to the larger streams, lakes, ponds, and wetlands to the estuarine, marine waters, and beyond. Within these expansive areas are both freshwater and marine habitats, riparian habitats, and upland terrestrial habitats. The Bristol Bay watersheds and portions of the Cook Inlet watershed that would be impacted by the proposed Pebble Project are virtually undeveloped and undisturbed. With little to no roads or development, the area is unique as one of the most wild, intact, and pristine areas in the world. Impacts to these unique watersheds will reverberate far beyond them and the State of Alaska.

The Proposed Pebble Project is larger than the conservative scenario that the USEPA evaluated in its 2014 watershed assessment. The proposed project exceeds the criteria set forth in the 2014 USEPA proposed determination for unacceptable adverse effects resulting in the complete loss of documented salmon streams, tributaries, and wetlands due to disposal of dredged or fill materials into waters of the U.S. to develop the mine pit, construct tailings impoundments, and store waste rock piles. In addition, water withdrawal and capture, water storage, water treatment, and release of wastewater associated with the proposed mine would significantly impair the fish habitat functions of other streams, wetlands, ponds, lakes, and aquatic resources through elimination, dewatering, and fragmentation. These losses would be irreversible and irretrievable. This was the finding of the 2014 EPA watershed assessment, and it didn't take into consideration potential impacts from related development, operation, and maintenance of supporting infrastructure, contamination from spills, alteration of streamflow and groundwater from withdrawal, storage, treatment, and wastewater discharge that combined would significantly impair watershed and fish habitat functions in other streams, tributaries, wetlands and aquatic habitats throughout the Bristol Bay watershed (USEPA 2014 a, b).

The DEIS continues to trivialize, diminish, and downplay the impacts that the proposed project would have on the landscape, as did the previous submittals related to permitting and environmental review. The DEIS claims that the proposed project will have a 20-year life-span. This is misleading, since the buildout and expansion would probably occur over 78 years, and the infrastructure, mine pit, and tailings storage facilities would be part of the landscape and require treatment, monitoring, and maintenance in perpetuity.

Additionally, other mining projects would be able use the Pebble infrastructure and thus overcome the economic barriers and develop new mines in the Bristol Bay region. Based on the other mining projects that would use the Pebble Project infrastructure, the proposed project would effectively be part of the Bristol Bay landscape forever, and the resulting mining wastes would require treatment and monitoring forever.

Short-term and long-term direct, indirect, and cumulative impacts related to the magnitude and longevity of the proposed mine and associated infrastructure were not appropriately evaluated in the DEIS. The DEIS must be revised to evaluate the additional build out as it is a reasonably foreseeable future condition under NEPA.

The DEIS is misleading in that it does not recognize Bristol Bay and Cook Inlet as economic engines that support existing businesses, livelihoods, and ways of life in Alaska, the lower 48

states, and across the world. The DEIS only promotes the economic value of the proposed Pebble Project and claims that the proposed project is expected to employ significantly less people and be in production for only 20 years. Recent news of the Mount Polley mine shutting down due to low copper prices is disconcerting and further supports the need to protect the world's largest sustainable and renewable commercial, subsistence, and sport fisheries in the area, and the thriving ecotourism industry for generations to come.

Short-term and long-term direct, indirect, and cumulative impacts related to loss of salmon as an economic engine were not appropriately evaluated in the DEIS, nor could they be since most of the baseline data and information is very old, much of it dating from before 2010. The DEIS must be revised to establish an adequate economic analysis of the loss of salmon to the local, regional, state, national and world economy.

Aside from the proposed open-pit mine leaving a massive footprint across at least two watersheds, the infrastructure required to support the mine would leave an immense destructive footprint across large mostly wild and pristine geographic areas including close to 70 miles of roads and additional spur roads with 97 river and stream crossings, 11 bridges, and 88 culverts. The roads will cross through and over several watersheds and large fish-bearing rivers, streams, and tributaries and through a mosaic of wetlands, lakes, ponds, bogs, marshes, riparian areas, and upland areas. In each case, the crossing would bifurcate and forever alter each river, stream, lake, pond, or wetland the proposed roads cross.

An 18-mile ice-breaking ferry route will require ferry terminals and a port facility with associated offices, storage facilities, power plants, and an extensive network of road causeways built over and into the marine environment. The proposed gas pipeline is 187 miles long with associated fiber optics going overland and under Cook Inlet and Iliamna Lake. The transportation corridor would see 35 daily round trips with large air-polluting trucks transporting mineral concentrates, daily transports via barge, including icebreaking vessels, to eventually load materials to ships over 12 miles offshore. All this construction and subsequent operations would be conducted in an area known for intense, long-lasting high winds, waves, and tidal cycles.

Short-term and long-term direct, indirect, and cumulative impacts related to the proposed mine and supporting infrastructure were not appropriately evaluated in the DEIS. The DEIS must be revised with an expanded analysis area to thoroughly evaluate impacts related to the proposed mine and supporting infrastructure at a watershed and landscape scale.

Roads, stream crossings, and infrastructure associated with the Proposed Pebble Project would adversely impact water quality and quantity for downstream areas. The ways that these structures and infrastructure would impact the aquatic ecosystem include:

- Degrade and disconnect floodplains from streams
- Artificially increase drainage networks
- Confine channels
- Chronically deliver fine sediments, including airborne fugitive dust, that impair water quality and instream habitat
- Reduce large wood and coarse sediment input
- Alter natural high- and low-stream-flow regimes
- Intercept subsurface and overland flow
- Compact riparian soils, thus reducing infiltration
- Reduce vegetation in riparian habitats, thus reducing shade and increasing stream temperature
- Block passage to critical habitats required by salmon and other aquatic and terrestrial species

Roads and associated infrastructure are one of the top causes of the impending collapse of wild salmon in the lower 48 states. The billions of dollars spent on retrofit and restoration has not been able to recover wild salmon populations.

Short-term and long-term direct, indirect, and cumulative impacts related to roads and infrastructure were not appropriately evaluated in the DEIS. The DEIS must be revised to thoroughly evaluate impacts related to the roads and supporting infrastructure at a watershed and landscape scale.

The following statements are taken from Page 4.16-32 in the section titled "Surface Water Extraction" for Alternative 1:

The magnitude and duration of the maximum projected surface water use along the transportation corridor during the 4-year construction phase would be a total of 49 million gallons: 19 million gallons along the mine access road, 6 million gallons along the Iliamna spur road, and 24 million gallons along the port access road. Estimated average extraction rates would range from 500 to 1,000 gpm, depending on the streamflow/volume of the waterbody (PLP 2018-RFI 022).

Referring to Appendix K, Section K2.0 Alternatives, the estimated range of surface water extraction for the proposed project is 49 to 132 million gallons. This high volume of surface water extraction from rivers, streams, lakes, and ponds would drastically alter the natural stream flow regimes and hydrology required to support natural riverine and wetland function and natural system processes and adversely impact water quantity and quality in downstream areas. Additionally, contamination related to construction, operation, and maintenance of the mine and infrastructure would be introduced to the otherwise pristine watersheds drastically reducing water quality. Copper concentrations in water derived from construction, operation, and maintenance of the mine and roads, including 35 or more truck roundtrips per day, are expected to increase to levels above water quality standards through runoff and airborne fugitive dust. Copper is known to be a toxic contaminant to salmon adversely impacting the salmon's sense of smell which can impede migration, foraging, and avoidance of predators. At just 2 to 20 parts per billion, copper toxicity can result in acute effects including death, chronic effects including impaired function, and behavioral effects including avoidance.

Short-term and long-term direct, indirect, and cumulative impacts related to contamination from copper and other toxic metals were not appropriately evaluated in the DEIS. The DEIS must be revised to thoroughly evaluate impacts to aquatic resources from copper and other toxic metals and to ensure water quality standards meet state and federal requirements.

The proposed tailings storage facilities (TSF) would hold immense amounts of mine waste, contaminated water, and toxic materials including copper, selenium, arsenic, and other metals that are toxic to fish and aquatic life. The proposed TSF would require maintenance in perpetuity to avoid release of toxic water and materials to the surrounding watersheds. Given the frequent occurrence of extreme weather events, geologic hazards, and potential for earthquakes in Alaska, particularly in this region, it will be virtually impossible to avoid a large devastating spill or dam breach for the rest of eternity. Just in the last five years, large catastrophic tailings dam failures have occurred devastating watersheds in Canada, Brazil, and across the world. Recent modeling shows that a failure of the Proposed Pebble Project tailings dam is predicted to

severely impact hundreds of miles of anadromous waters mapped in the current Anadromous Waters Catalog (AWC), covering and contaminating critical spawning, rearing, and foraging habitat for years (Wobus, 2019). A dam failure of this magnitude would be catastrophic to salmon and the watershed. As stated on the ADF&G AWC website, it is believed that the number of streams, rivers, and lakes listed in the AWC represents a fraction of the streams, rivers, and lakes actually used by anadromous species. The Bristol Bay watershed is such an area that is lacking a full inventory of anadromous waterbodies. Until these habitats are inventoried, they will not be protected under State of Alaska law.

Short-term and long-term direct, indirect, and cumulative impacts related to a dam failure were not appropriately evaluated in the DEIS. The DEIS must be revised to thoroughly evaluate impacts related to a dam failure at a watershed and landscape scale.

Comments to DEIS Baseline Studies (Sections 3.1; 3.6; 3.9; 3.22-3.26)

The DEIS used inappropriate and inadequate methods to evaluate the presence and habitat use of fish, birds and wildlife. Many studies were conducted without the proper development of objectives and statistically sound methods. Baseline information for the DEIS relies heavily on studies conducted from 2004 to 2008. The most significant fatal flaw in the studies used to establish the environmental baseline in the DEIS is that studies conducted to manage fish and wildlife populations and human use are not sufficient to predict or determine long-term effects of a mine. Many of the aerial and ground-based surveys used to monitor birds and mammals are not appropriate to establish presence, habitat use and migratory routes. Additionally, some of these surveys were conducted during the incorrect seasons or during the wrong part of the day.

Extensive habitat models exist to evaluate the presence and habitat use of fish and aquatic resources. These methods must be used to further evaluate the short-term and long-term direct, indirect, and cumulative impacts of the proposed project to aquatic resources and fish and fish productivity in the watersheds. While the AWC is a useful tool to show general distribution of salmonids, it does not represent the full distribution for the area, since it only shows distribution for those streams that have been surveyed and does not evaluate or document suitable spawning and rearing habitat, leaving large portions of the watersheds unaccounted for in this respect. The DEIS fails to provide a comprehensive evaluation of the impacts to all life histories across genetically distinct populations of salmon and other fish and their use of habitat throughout the watersheds. A project of this magnitude is likely to adversely impact salmon and

other fish at the individual and population level reducing the abundance, productivity, spatial structure, and diversity of each species thus reducing the viability of populations.

The DEIS provides an inadequate baseline for existing environmental conditions related to anadromous waters and distribution of salmonids. The DEIS must be revised to establish an adequate baseline for existing environmental conditions including conducting studies to thoroughly inventory anadromous waterbodies and update the Anadromous Water Catalog to ensure all waters supporting salmonids are afforded protections under Alaska Statute § 16.05.871.

Habitat models also exist to evaluate the presence, habitat use, and migratory corridors of wildlife. For example, extensive habitat connectivity models exist from the Kenai Peninsula using resource selection functions to evaluate the effect of development related to improvements of Sterling Highway – a significantly smaller project than the Proposed Pebble Project – on focal species including brown bear, black bear, wolverine, Dall sheep, Canada lynx, and moose (Suring, et. al. 2017). These models can help determine areas of disturbance for mammals such as brown bear that require large seasonal and home ranges and are known to be significantly impacted by roads and other infrastructure resulting in negative impacts at the individual and population levels (Suring, 2019). Seasonal and home ranges for brown bears in southwest Alaska can range from 36 to 286 square miles. The DEIS evaluated a small area and did not take into consideration the extensive migration patterns of brown bears and other wildlife. This small area of evaluation is not supported by scientific literature related to brown bear habitat use and home ranges. Given the magnitude, longevity, and far reaching impacts of the Proposed Pebble Project, evaluations such as those conducted in the Kenai Peninsula and elsewhere must be conducted for both aquatic and terrestrial focal species in the Bristol Bay and Cook Inlet watersheds.

The DEIS provides an inadequate baseline for existing environmental conditions. The DEIS must be revised to establish an adequate baseline for existing environmental conditions using comprehensive and updated information across complete life cycles of fish, wildlife and plants, over all critical life stages, and in a manner that will allow understanding of natural variation versus project related perturbations.

Key Issues for Watersheds, Aquatic and Terrestrial Resources and Communities

In summary, the DEIS (as well as other Proposed Pebble Project materials that have been previously released and commented on) are inadequate as they are based upon old, incomplete and inaccurate data not consistent with today's professional standards. Because of this, PLP and the Corps are complicit in obfuscating critical issues pertaining to the impacts of the proposed mine. Additionally, the DEIS does not thoroughly and appropriately evaluate the environmental and serious social impacts of the proposed project. The DEIS arbitrarily and capriciously reduces the analysis area by X% to an inappropriately restricted size and miniscule timeframe in an attempt to hide or ignore environmental effects for the mine and associated infrastructure. This does nothing but confuse the public and decision makers and whitewashes potential environmental effects. Because of these critical flaws, the DEIS does not properly take into consideration all the potentially affected watersheds and direct, indirect and cumulative impacts associated with the proposed project. Instead, the DEIS partitions and disconnects aquatic and terrestrial habitats, including migratory corridors and recognized conservation areas, and this does not provide adequate evaluations of the impacts to this unique ecosystem. Additionally, the DEIS minimizes mitigation measures that will be required to compensate for the irreversible damage that will occur to the watersheds and their aquatic and terrestrial resources as well as human use. The DEIS is fatally flawed and should be revised based on the best available science, and the revised DEIS should be reissued to cooperating agencies and the public for review and comment.

The following natural resources and considerations are of major concern with respect to the inadequate evaluation presented in the DEIS:

- Current watershed health, function, and value
- Water, fish, and aquatic resources, especially salmon
- Wildlife, migratory routes, and threatened and endangered species
- Climate change
- Inability to restore the watershed ecosystems once damaged
- Importance of Bristol Bay and Cook Inlet to local, regional, and global communities
- Importance of the Bristol Bay and Cook Inlet fisheries to already existing industries and businesses

Because a proposed project of this magnitude, with a development footprint and hazardous tailings waste that will last in perpetuity, has far reaching implications at the local, regional, national, and global level, the DEIS must evaluate these fully functioning ecosystems as a whole and fully consider the repercussions of them being severally impacted by the Proposed Pebble Project. Additionally, climate change is occurring and will continue to affect ecosystems in Alaska; therefore, the effects of climate change should be included in the evaluation to determine the impacts of sea level rise and catastrophic events such as landslide, flood, avalanche, changes in ambient winter and summer temperatures, changes in the hydrologic regime, and major weather events. Loss of carbon sequestration due to major removal of vegetation and wetlands and how this impacts greenhouse gas emissions should be included in this evaluation. Loss of habitats and shifting migration patterns related to climate change should be recognized and evaluated for aquatic and terrestrial species.

Comments to the DEIS are further outlined below and in the Key Issues identified for aquatic and terrestrial resources. More detailed and comprehensive comments are provided in the Comprehensive Comments from Review of the Preliminary DEIS (Ridolfi, 2019).

Key Issue 1: Inadequate recognition of current watershed health, function, and value and the inability to restore the watershed ecosystems once damaged (DEIS Sections 3.1; 3.6; 3.9; 3.22-3.26)

- The watersheds and fully functioning natural ecosystems within the areas affected by the proposed project are irreplaceable and cannot be restored once damaged by construction and operation of a large-scale metal mine and associated infrastructure. No viable alternatives for mitigation (avoidance, minimization, compensation) or restoration have been identified.
- Restoring damaged areas is virtually impossible, since restoration has never been done on this expansive scale, and there are few areas within the watersheds affected by the proposed project that are currently in need of restoration. Hence, the applicant will find it impossible to implement compensatory mitigation projects with sufficient functional lift to achieve replacement requirements. The valuable natural resources and cultural resources in the areas affected by the proposed project will be sacrificed and lost if the Proposed Pebble Project is permitted and constructed. "Out-of-kind" mitigation is NOT recommended, it will NOT replace lost aquatic functions, and lead to the irretrievable loss of salmon and the ecosystem.



- Mitigation or restoration on this scale has never been attempted. Re-creating a functioning watershed is virtually impossible. Humans cannot improve intact natural ecosystems. Removing streams, tributaries, wetlands, and ponds from a watershed for over 25 years will result in loss of natural process and function and will adversely impact inputs to downstream areas by such mechanisms and effects as sediment transport, loss of interstitial spaces due to lack of sediment transport, compaction of substrates, addition of detritus and nutrients, changes to water chemistry, loss of macroinvertebrates, loss of prey, changes in high and low flow regimes, groundwater upwelling, aquifer recharge, changes in hyporheic function, changes in hydrological and geomorphological processes and function, changes in temperature regimes, changes in physical and biological processes, loss of riparian and terrestrial habitat, changes in soil ecology, etc.

Key Issue 2: Inadequate evaluation of potential impacts to water, fish, and aquatic resources, especially salmon (DEIS Sections 4.1; 4.6; 4.9; 4.22-4.26)

- The invaluable salmon resource and the ecosystem on which the salmon rely for survival are irreplaceable. If permitted and constructed, the Proposed Pebble Project will substantially damage or destroy this fully functioning natural ecosystem and cause a substantial economic loss to local, state, national, and world markets.
- A thorough and comprehensive evaluation of potential impacts to water, fish, and aquatic resources, especially salmon, is needed to comply with the National Environmental Policy Act (NEPA) and support a properly informed permitting decision.
- A more accurate and comprehensive evaluation of the risks to aquatic resources including a catastrophic tailings dam failure is needed. In the DEIS, risks to streams appeared to be addressed mainly with respect to temporary water quality effects and risks to fish only during the time of a spill or release event. There was little to no discussion of the effects on other aquatic life, sediment contamination, and permanent changes to habitat that would impact fish and other aquatic life in the aftermath of a spill or release. Incorrect assumptions were made regarding the ability of metals in tailings to be released to overlying water based on geochemistry. The ability of metals to impact the food chain through ingestion was entirely ignored.



- The Spill Risk section of the DEIS included several comments in passing about the mine operator removing tailings from streams; this would be virtually impossible given the rocky substrate, the fine-grained particle size of the tailings, and the remote wilderness environment. Should tailings removal from remote streams be attempted, it might do more harm to habitat than good. Realistic assessments need to be included in the DEIS recognizing the permanence of tailings in streams and the associated habitat alteration, damage, and loss after a spill or release.

Key Issue 3: Inadequate evaluation of potential impacts to wildlife, migratory routes, and threatened and endangered species (DEIS Sections 4.1; 4.6; 4.9; 4.22-4.26)

- The sections of the DEIS on Wetlands, Wildlife, Fish, and Vegetation provide an incomplete, inadequate, and narrow discussion for a project of this size that spans an expansive landscape encompassing several watersheds. If permitted, constructed, and operated, the proposed project would adversely impact several aquatic and terrestrial species in Bristol Bay and Cook Inlet.
- The proposed project will require intact, fully functioning streams, tributaries, wetlands, and ponds to be removed, altered, discharged into, dredged, and filled in a mostly pristine, wild, and fully functioning watershed for over 25 years. This would result in removal of an interconnected ecosystem and loss of the biodiversity and functional habitat and services provided to the watersheds on which aquatic and terrestrial resource rely.
- Mitigation or restoration on this scale has never been attempted. Re-creating a functioning watershed is virtually impossible. Humans cannot improve intact natural ecosystems. Removing streams, tributaries, wetlands, and ponds from a watershed for over 25 years will result in loss of natural process and function and will adversely impact inputs to downstream areas by such mechanisms and effects as sediment transport, loss of interstitial spaces due to lack of sediment transport, compaction of substrates, addition of detritus and nutrients, changes to water chemistry, loss of macroinvertebrates, loss of prey, changes in high and low flow regimes, groundwater upwelling, aquifer recharge, changes in hyporheic function, changes in hydrological and geomorphological processes and function, changes in temperature regimes, changes in physical and biological processes, loss of riparian and terrestrial habitat, and changes in soil ecology.



- Statements and conclusions regarding the effects of the proposed project on brown bear migratory routes are incomplete and inadequate. The proposed transportation routes will adversely impact brown bears and the ecotourism industry in McNeil River State Wildlife Sanctuary and Refuge, Katmai National Park, and other valuable wildlife areas.
- The plans for transportation and shipping across watersheds and in areas that are not navigable due to high winds, extreme tides, and shallow rocky water need to be thoroughly vetted with the U.S. Coast Guard, local vessel captains and vessel owners, and other knowledgeable individuals.
- The evaluation in the DEIS of potential impacts to threatened and endangered species is incomplete and inadequate. The Threatened and Endangered Species (TES) sections in the DEIS provide incomplete and narrow discussions for a project of this size that spans an expansive landscape encompassing several watersheds. If permitted, constructed, and operated, the proposed project would impact several aquatic and terrestrial species on which TES and State of Alaska Special Status Species in Bristol Bay and Cook Inlet rely for survival.

Recommendations

Given the significance of this fatally flawed and misleading DEIS document, the DEIS should be completely revised after public comments are received and adequate baseline studies are completed to facilitate appropriate evaluation of short-term and long-term direct, indirect and cumulative impacts that will result in irreversible damage and irretrievable commitments of aquatic and terrestrial resources in Bristol Bay and Cook Inlet watersheds. Once revised, the DEIS should be reissued to cooperating agencies and the public, and an appropriate amount of time should be allowed for the cooperating agencies and the public to review and comment on the revised DEIS.

To appropriately evaluate the impacts resulting from destruction of this interconnected ecosystem and complete loss of the biodiverse and functional habitat and services provided to freshwater, estuarine and marine aquatic and terrestrial resources, ecological studies must be conducted at the watershed and landscape level. Appropriate baseline information would include biological studies geared at documenting the full life histories of the longest-lived fish present. In respect to Chinook salmon, this could be upwards of 10 years. Longer lived mammals, such as brown bear, would require a much longer timeframe to establish an appropriate baseline. This broad temporal and spatial scope at the watershed and landscape

scale is required to provide a comprehensive evaluation of impacts. Long-term physical studies would also be conducted to provide a baseline watershed health and function.

Watershed and landscape-scale analysis is a systematic process for characterizing the aquatic, riparian, and terrestrial features within a watershed. Watershed and landscape evaluations are not new in the NEPA world. In fact, agencies such as the U.S. Forest Service have had management guidance used in NEPA efforts for decades. The Aquatic Conservation Strategy in the Northwest Forest Plan provides nine objectives intended to emphasize and facilitate the protection and restoration of riparian dependent resources, functions, and processes at the watershed and landscape level. These nine objectives are included here as an example or tool that could be used to inform the design of broad temporal and spatial scope studies that when conducted at the watershed and landscapes level would provide adequate baseline information for evaluating the consequences of a project such as the Proposed Pebble Project (USFS, 1994 ROD).

1. Maintain and restore the distribution, diversity, and complexity of watershed and landscape-scale features to ensure protection of the aquatic systems to which species, populations and communities are uniquely adapted.
2. Maintain and restore spatial and temporal connectivity within and between watersheds. Lateral, longitudinal, and drainage network connections include floodplains, wetlands, upslope areas, headwater tributaries, and intact refugia. These network connections must provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species.
3. Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations.
4. Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Water quality must remain within the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities.
5. Maintain and restore the sediment regime under which aquatic ecosystems evolved. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport.



6. Maintain and restore in-stream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows must be protected.
7. Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands.
8. Maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply the amounts and distribution of coarse woody debris necessary to sustain physical complexity and stability.
9. Maintain and restore habitat to support well-distributed populations of native plant, invertebrate, and vertebrate riparian-dependent species.
10. *BRISTOL BAY WATERSHEDS SHOULD BE PROTECTED.*